

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:
Aeroqual
Model AQY v0.5

Pollutants:
PM_{2.5}

Measurement Range:
0 - 1000 µg/m³

Type: Optical



Additional Information

Field evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/field>

Lab evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/laboratory>

AQ-SPEC website:

<http://www.aqmd.gov/aq-spec>

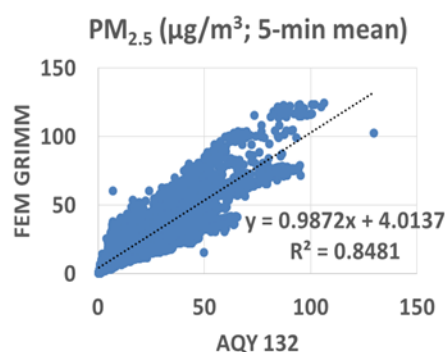
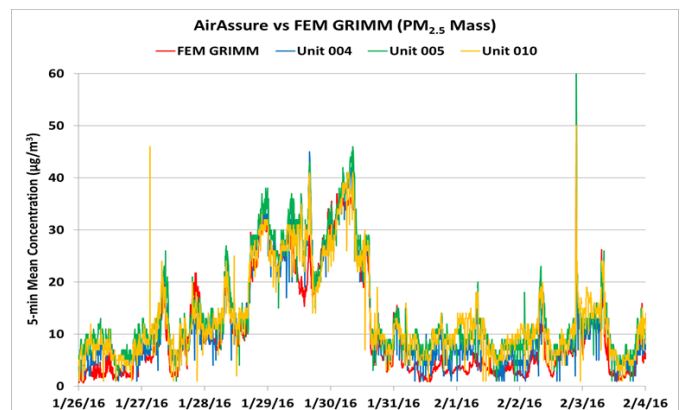
Evaluation Summary

- Overall, the three Aeroqual AQY sensors showed low to moderate accuracy. They overestimated the FEM GRIMM PM_{2.5} measurements for a concentration range between 0 to 400 µg/m³
- The three Aeroqual AQY sensors exhibited high precision for all T/RH combinations tested in the environmental chamber.
- Aeroqual AQY sensors (units IDs: 130, 131, 132) showed low intra-model variability in the field deployment as well as in the laboratory testing.
- Aeroqual AQY sensors had good data recovery (>99% for 5-min average in the field, and 100% for 1-min average in the laboratory).
- For PM_{2.5}, the Aeroqual AQY sensors showed good correlation with the reference instrument from both the field ($R^2 > 0.84$) and laboratory studies ($R^2 > 0.99$).

Field Evaluation Highlights

- Deployment period 12/22/2017- 03/27/2018: the Aeroqual AQY sensors (units IDs: 130, 131, 132, 134) showed good correlations with PM_{2.5} concentration change as monitored by FEM GRIMM and FEM BAM.
- The units showed > 99% data recovery as well as low intra-model variability.

$R^2 \sim 0.86$



Coefficient of Determination (R^2) quantifies how the three sensors followed the PM_{2.5} concentration change by FEM GRIMM.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy

$$A(\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

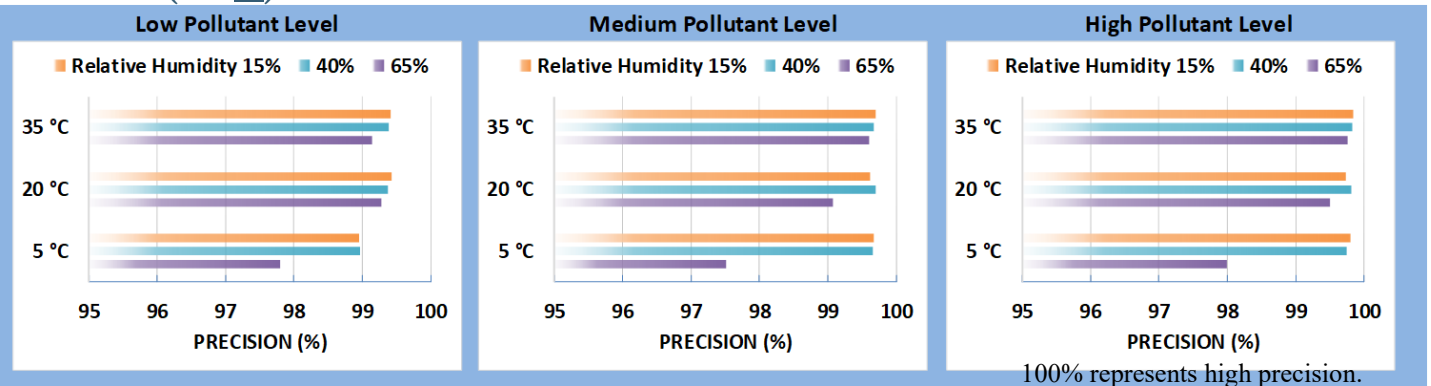
Steady State (#)	Sensor Mean (µg/m³)	FEM GRIMM (µg/m³)	Accuracy (%)
1	28.2	17.0	34.6
2	50.1	34.7	55.6
3	109.6	69.8	42.9
4	188.0	117.0	39.4
5	407.0	244.0	33.2
6	581.4	366.5	41.4

Accuracy was evaluated by a concentration ramping experiment at 20 °C and 40%. The sensor's readings at each ramping steady state are compared to the reference instrument.

A negative % means that sensors overestimate reference instrument's reading by 2 folds.

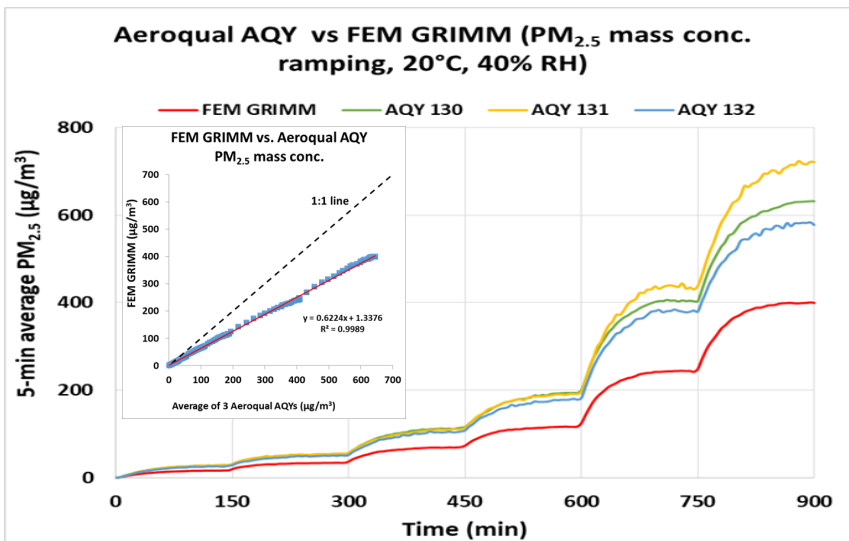


Precision (PM_{2.5})



Sensor's ability of generating precise measurements of PM concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and dry (5 °C and 15%), cold and humid (5 °C and 65%), hot and humid (35 °C and 65%), or hot and dry (35 °C and 15%).

Coefficient of Determination



The three Aeroqual AQY sensors showed excellent correlation with the corresponding FEM PM_{2.5} data ($R^2 > 0.99$) at 20 °C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had minimal effect on the Aeroqual AQY sensors' precision. At the set-points of RH changes, Aeroqual AQY reported spiked changes in concentrations.

Observed Interferents

N/A



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